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Experimental Planting of FOOD and COVER for DEER



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from 0.5 to 2.7 inches. Tracks and droppings found in these plantings indicated that deer, grouse, and rabbits had used the cover to a limited extent.



Fig. 1--Balsam fir planting that was severely browsed by deer.

The 2 black spruce plots contained 147 trees; 1 was planted in an aspen stand and the other in an alder thicket. The trees averaged 8 feet in height when planted and were taken from a swamp about a mile away. The cost of planting the 147 black spruce and the 302 balsam firs using Civilian Conservation Corps labor averaged 67 cents per tree.

In the fall of 1936 there was only one dead tree in the two spruce plantings, making a 99.3 percent survival. The trees in the alder association had been severely clipped by snowshoe hares up to 5 feet above the ground, but the other group was not damaged. Deer did not browse either group. By 1938, only 2 trees had died, but some of those in the alder had been trimmed by hares up to 8 feet above ground, and many had developed double tops. This high feeding was made possible by drifted snow. In both plots the trees were heavily laden with cones, which was unusual for such small trees. The spruce seeds produced were utilized by red squirrels. Eleven grouse forms containing droppings were found under 1 spruce clump, and deer droppings were also present, indicating protective value of the plantings. The final check on these 2 plots was made in September 1946, when 77.6 percent of the trees were still alive. Most of the spruce mortality took place in the alder stand where the hares did so much damage. One of these trees had recently been killed by porcupine girdling. In that group there was only a 40.4 percent survival; in the aspen there was a 95 percent survival, with the trees varying from 12 to 21 feet in height and averaging about 16 feet. The d.b.h. varied from 1.25 to 3 inches and averaged 2.1 inches. In contrast the spruce planted in the alder, varied from 8 to 17 feet high, averaged 12.4 feet, and the d.b.h. varied from 1 to 3 inches and averaged 1.8. Numerous deer and rabbit droppings showed that these animals had made good use of the cover provided.

PLANTINGS IN DEER YARDS

The success of the plantations made by Mr. Hunt both in survival and use by animals, particularly deer, suggested the idea of making a series of cover plantings between isolated fragments of deer yards for the purpose of providing cover between these areas, thus helping to utilize browse not being eaten, and obtain a wider dispersal of wintering deer.

Considerable acreages of such coverless areas have been created by forest fires in the Lake States and will not receive maximum use by deer until more winter cover is available. Figure 2 shows a typical area along Lake Superior in the State of Minnesota denuded of coniferous cover by fire. Figure 3 illustrates the type of interspersation between food and cover that is considered desirable.



Fig. 2--An extensive burned area along Lake Superior separating segments of deer yards. The open areas contain great quantities of winter browse, but are not utilized due to lack of protective cover for the deer.



Fig. 3--An ideal interspersation of food and cover as provided by this old clearing which was an old sawmill site. Such areas are heavily utilized by deer each winter.

In the springs of 1937 and 1938, a total of 9 plots of cover plantings, approximately 50 by 100 feet, with the trees spaced 8 by 10 feet, was made. Balsam fir, white cedar (*Thuja occidentalis*) and black spruce were used. Survival of the black spruce was good, but was very poor for the other 2 species. The chief contributing factor in the poor survival was the use of suppressed trees that were too old and too large for such handling, some of them being 10 to 12 feet high, whereas the black spruce trees averaged 4 to 6 feet in height.

These plantings, like those put out in 1934, were severely browsed by deer the first winter. The only balsam fir that survived were the larger trees with foliage beyond reach of the deer. Even the black spruce was heavily damaged, which is unusual because this species is seldom browsed under natural conditions. (See fig. 4.) In the fall of 1946 an attempt was made to obtain survival figures on these plantings, but the dense brush and loss of stakes with their identifying numbers made this impossible. Perhaps not more than a 30 percent survival was obtained, however, some of the balsam firs were over 20 feet high while others were still under 6 feet due to repeated deer browsing. The black spruces varied from 5 to 11 feet in height and averaged 8 feet. Deer had used these clumps to a considerable extent and will use them more as they provide more cover.

A tenth cover planting of 300 2-2 white spruce (*Picea canadensis*) was made in April 1941 adjacent to an earlier one. These trees were about 6 inches high when planted and by 1946 had grown until they averaged almost 3 feet--the maximum growth being 6 feet and the smallest tree was still 6 inches. Although many of these trees suffered setbacks from snowshoe hare clipping, the survival was at least 95 percent.



Fig. 4--A transplanted black spruce that was severely browsed by deer the first year. At the time of planting this tree had a beautiful conical shape.

PLANTING VERSUS NATURAL REGENERATION OF BROWSE SPECIES

During the same period that the cover plantings were being made, a few choice deer food species were planted. This was done to determine the practicability of planting palatable supplementary food where such was scarce.

This study consisted of planting 10 plots of mountain ash (*Sorbus americana*) seedlings, and a group of white cedar wildlings, mountain maple (*Acer spicatum*) root cuttings and red-osier dogwood (*Cornus stolonifera*) nursery cuttings. The mountain ash plots were

located in an old burn, and the other plantings in a clearing made in a dense stand of white cedar, balsam fir and white birch (Betula papyrifera) in an area of heavy deer concentration.

The mountain ash seedlings were placed in 10 plots under varying habitat conditions in May 1937, each plot consisting of 100 seedlings planted at approximately 4-foot intervals each way. One plot was enclosed by rabbit- and deer-proof fencing. At the end of the second growing season there was an 89 percent survival, varying in the individual plots from 97 percent in a young aspen stand to 76 percent in dense competition with beaked hazelnut (Corylus rostrata), mountain maple brush and grass.

The total survival in all plots had dropped to 69 percent by 1941 with a range from 87 to 34 percent. At that time it was found that 10.5 percent had been browsed by deer, 6.1 percent nipped by hares and 3.2 percent budded by ruffed grouse. The final check in 1946 showed an average survival of 51 percent ranging from 25 to 78 percent. The maximum growth, which was inside the enclosure, was 54 inches; the greatest growth outside the fence was 37 inches. The average height for all surviving plants was 18 inches, whereas, those within the enclosure averaged 25.

After this study was started it was interesting to find that mountain ash was quite abundant in that area, but was prevented from growing into worthwhile browse by the heavy use made of it by deer, hares, and grouse.

PLANTING IN NEWLY CLEARED FORESTS

In March 1938, a quarter-acre of dense deer yard approximately 50 by 220 feet was cleared near Lutzen, Minnesota. The overstory was composed of white cedar, balsam fir, and paper or white birch; the understory consisted chiefly of moss, Trillium, large-leaved aster (Aster macrophyllus) and bunchberry dogwood (Cornus canadensis). Other plants present in small numbers were white cedar seedlings, honeysuckle (Lonicera sp.), twin-flower (Linnaea borealis), raspberry (Rubus idaeus), ferns, mountain maple, mountain ash, buttercups (Ranunculus sp.) and sarsaparilla (Aralia sp.). An old logging road crossed the clearing and in it the vegetation was somewhat different, consisting predominantly of large-leaved aster and several balsam firs about 3 feet in height.

In April 1938 half of this clearing was planted to white cedar, mountain maple, and red-osier dogwood. In June of that same year, a hare- and deer-proof fence, 50 feet square, was constructed across the center of the clearing so that half of it contained the planted stock and the other half remained unplanted. The clearing outside of the fence on one end was therefore planted, while the other end remained unplanted. This arrangement was designed to provide information on the advantages of planting browse as against depending on natural reproduction, with the fence showing the part that the deer and rabbits play in this reestablishment problem. (See figs. 5 and 6.)

By October 1939, a great difference in the vegetation inside and outside the enclosure was apparent. The large-leaved aster was the only species that had made good growth on both sides of the fence. Considerable seedling growth of paper birch was present on the inside, but none was in evidence outside; balsam fir and white cedar seedlings were present on both sides of the fence. Raspberry had come in on both sides but was much more abundant on the inside. Suckers on the birch stumps inside the fence had attained a 6-foot height but those on the outside, due to repeated browsing, were only about 6 inches high. (Figs. 7 and 8.) Seedling fire cherries (Prunus pennsylvanica) of which there were more than 20, were 6 feet high inside, and on the outside none could be found. Fireweed (Epilobium sp.) was abundant on the inside but lacking outside. Several mountain ash seedlings were present inside but none were found on the outside.



Fig. 5--Cleared area in dense deer yard showing location of fence. Note complete lack of under brush.



Fig. 6--The same area as Fig. 5 eight years later. Note scarcity of brush outside of fence and the luxuriant growth inside where deer were excluded.



Fig. 7--White birch stump outside of fence with one year's sucker growth which was heavily browsed by deer.

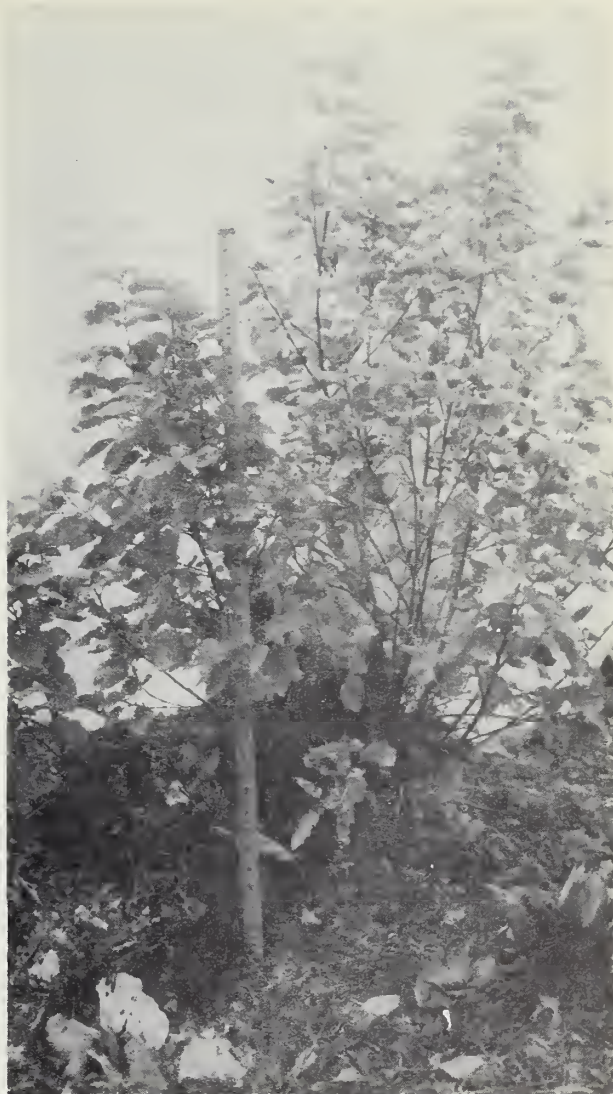


Fig. 8--White birch stump inside fence showing extent of growth in one year when not subject to deer browsing.

By October 1940, white cedar seedlings were coming in all over the clearing both inside and outside the fence. Inside, some of the birch suckers were 8.5 feet high, the seedlings 5 feet, and fire cherries all heights to 8 feet. Mountain ash was coming well on the inside, as well as profuse growth of raspberry and fireweed. Golden-rod (*Solidago* sp.) although present on both sides in small quantities, was more abundant on the inside. A few fire cherry seedlings were found on the outside but repeated browsing had kept them to about 6 inches.

By October 1942, little other than raspberry was growing well outside the fence. There was a good stocking of white cedar seedlings outside, but they were very small. Inside the fence, cedar was up to 2 feet; fire cherry, 13 feet; birch suckers, 14 feet; birch seedlings, 7 feet; mountain ash, 5 feet; and fireweed, 4 feet. There also was a heavy growth of annual vegetation, an abundant reproduction of cedar, balsam fir, and one white pine (*Pinus strobus*) within the enclosure.

By September 1946, when the last check was made, much of the vegetation was above the fence on the inside, but there was little change on the outside. On the outside were a few willows (*Salix* sp.) that averaged 23 inches high and were severely browsed and 3 balsam firs

that averaged 36 inches. These latter trees were present in the old logging road when the plot was established. Paper birch seedlings were numerous but were kept down by deer browsing so they averaged only 17 inches in height. The ground cover consisted of raspberry, thimbleberry (Rubus parviflorus), large-leaved aster, and golden-rod.

Inside the fence the cedar averaged 39 inches (not considering new reproduction that had appeared within the last year); balsam fir, 29 inches; mountain ash, 80 inches; fire cherry, 13 feet; paper birch seedlings, 10.5 feet; paper birch sprouts, 19 feet; mountain maple, 13 feet; and willow, 13 feet. The overstory was now predominately birch and fire cherry and the ground cover raspberry, fireweed, everlasting (Antennaria sp.), Canadian thistle (Cirsium arvense), and golden-rod.

The survival and growth of the planted species inside and outside the fence are best shown in the following table:

Species	Percentage of survival				Average height in Inches	
	Fall - 1938		Fall - 1946		Fall - 1946	
	Outside fence	Inside fence	Outside fence	Inside fence	Outside fence	Inside fence
White cedar	92	94	18	83	10	24
Mountain maple	83	78	38	56	23	83
Red-osier dogwood	92	83	42	53	21	80

Another deer-proof enclosure was established in 1938 in a partial clearing in a deer yard where small seedling cedars were quite abundant but browsed by deer. After 8 years (1946) measurements were made on the growth of cedar both inside and outside the enclosure. Considerable effort was expended to find 29 trees on the outside that could be measured. They averaged 12 inches in height. Inside the enclosure cedar was abundant and in all stages of reproduction up to 7 feet. The average height of 56 of the larger trees, that were mere seedlings when the fence was built in 1938, was 2 feet.

SUMMARY AND RECOMMENDATIONS

The conclusions to be drawn from these studies are:

1. Coniferous plantings were utilized by deer, hares and grouse for protective cover. Red squirrels fed on the seeds produced.
2. It is not practical to plant balsam fir and white cedar as these species are too severely browsed by deer.
3. The planting of mountain ash in areas where deer are quite numerous is not advisable. This species is subject to pressure from deer, hares, and ruffed grouse and therefore has little chance of survival. In a goodly portion of the area where these studies were made, mountain ash is well distributed, and reproduction ample where these animals do not prevent its normal growth. In most areas there is a wide gap between mature trees and young growth under 2 feet. This reproduction is represented by age classes from seedlings to trees 10 to 15 years' old that have been suppressed by animal usage.
4. Large trees from natural stands are not suitable due to excessive planting cost and low survival.
5. Where planting in sparse deciduous tree and shrub stands is primarily for game cover it is recommended that small nursery stock of white or black spruce be planted in chain or checkerboard fashion. This will provide good future interspersion of food and cover, increase the carrying capacity of the forest for deer, and eventually provide a crop of timber.

6. Natural production of deer browse plants will develop in the northern Lake States if not prevented by too large a deer herd.
7. Planting of browse species for deer is not necessary in this region, is impractical and will not be any more productive than natural regeneration where deer are numerous.

